

**COMPARATIVE PHOTOPHYSIOLOGY OF TWO FERNS WITH
CONTRASTING MORPHOLOGY AND PHYSIOLOGICAL ECOLOGY :
ADIANTUM TIBETICUM CHING AND *DRYOPTERIS LEPIDOPODA* HAYATA**

O. ROGER ANDERSON*

Biology and Paleo Environment, Lamont-Doherty Earth Observatory of Columbia University, Palisades, NY 10964

(Received December 19, 2022; Revised Accepted December 24, 2022)

ABSTRACT

Adiantum tibeticum Ching and *Dryopteris lepidopoda* Hayata are montane ferns found in the Himalaya, and more broadly in Asian cool mountain locales. They are very different in their morphology and adaptive features. Laboratory evidence reported here indicates *A. tibeticum* tends to have lower photosynthesis rates than *D. lepidopoda*, when expressed per leaf area. It has higher photosynthesis rates based on leaf fresh weight, and comparable rates based on leaf dry weight. Specific leaf area was higher for *A. tibeticum* compared to *D. lepidopoda*, but all leaf fluorescence analyses of photosystem II (PSII) functions showed higher values for *D. lepidopoda* compared to *A. tibeticum*. Ecophysiological implications are discussed.

Key Words : Comparative ecophysiology, photosynthesis rate, dark respiration rate, leaf fluorescence analyses.

INTRODUCTION

Adiantum tibeticum Ching and *Dryopteris lepidopoda* Hayata are widely occurring ferns in cool mountainous regions of Asia (Plants of the World Online–Kew, 2022). Both are reported in the Indian Himalaya (e.g., Fraser-Jenkins 2019, Punetha *et al.* 2013). A substantial amount of research has documented the biogeography, distribution and diversity of montane ferns, including *Adiantum* and *Dryopteris* spp. (e.g., Samant *et al.* 2005, Punetha & Kholia 2010, Bhakuni *et al.* 2021, Haq *et al.* 2022). Current research on the ecology of ferns is nicely summarized by Mehltreter *et al.* (2010). However, less attention has been given to their physiological ecology, although the volume of ecophysiological research on ferns is increasing substantially (e.g., Anderson 2021); particularly with mounting evidence of climate change that may affect fern adaptability and survival (Sharpe 2019, Anderson 2022, Mehltreter & McAdam 2022).

A. tibeticum and *D. lepidopoda* have highly contrasting morphology and leaf anatomy. *A. tibeticum* is ca. 30 cm tall at maturity, with creeping rhizome ca. 1.5 mm in diam. and spreading growth. Leaf lamina are thinly herbaceous, characteristic of the genus, abaxially glaucous, adaxially greenish, and both surfaces are glabrous. Leaves are tri-pinnate, ovate in outline, distally pinnate; pinnae are four or five on each side (Plate 1). *A. tibeticum* is a high-altitude (c. 3000 m), Himalayan octoploid species found in semi-open areas, among rocks and low bushes.

* E-mail : ora@ldeo.columbia.edu